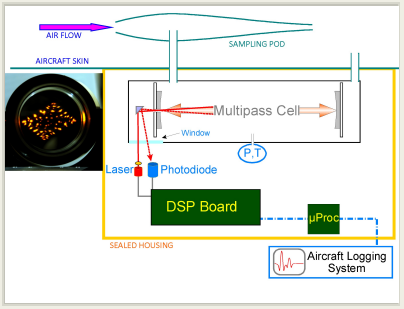
Instrument for Airborne Measurement of Carbonyl Sulfide, Phase I

Completed Technology Project (2015 - 2015)

Project Introduction

Southwest Sciences proposes to develop small, low power instrumentation for the real-time direct measurement of carbonyl sulfide (OCS) in the atmosphere, especially targeting airborne measurements. The instrument will be based on a recently introduced room temperature interband cascade laser (ICL) operating in the 4830 nm region. This laser has a substantially reduced (by a factor of approximately 12) power requirement than quantum cascade lasers operating in the same region and should be better-suited for use in atmospheric field instruments. The Phase I effort will concentrate on characterizing the sensitivity and precision that can be achieved for OCS measurement, using this laser in a laboratory prototype. The Phase I work will also include direct measurement of ambient carbonyl sulfide in the local outside air. The follow-on Phase II project will emphasize development of an airborne-worthy prototype instrument that can be field tested. Carbonyl sulfide is the most abundant naturally occurring sulfur species in the atmosphere, with previous measurements of its concentration yielding results in the range of 500 parts-per-trillion (ppt). The lifetime of OCS in the troposphere is believed to be several years, allowing its transport into the lower stratosphere where it is photochemically oxidized to sulfate particles. Improved understanding of the tropospheric – stratospheric exchange of this important species is needed to gain a better understanding of the role of OCS in sulfate particle production. In turn, the sulfate aerosol layer may significantly influence the earth's energy budget through increased solar scattering. Existing instrumentation for measurement of OCS is bulky and expensive and is complicated by several indirect steps. In contrast, this R&D effort will result in an instrument that measures OCS directly, in real time, with 1-second time response or better.



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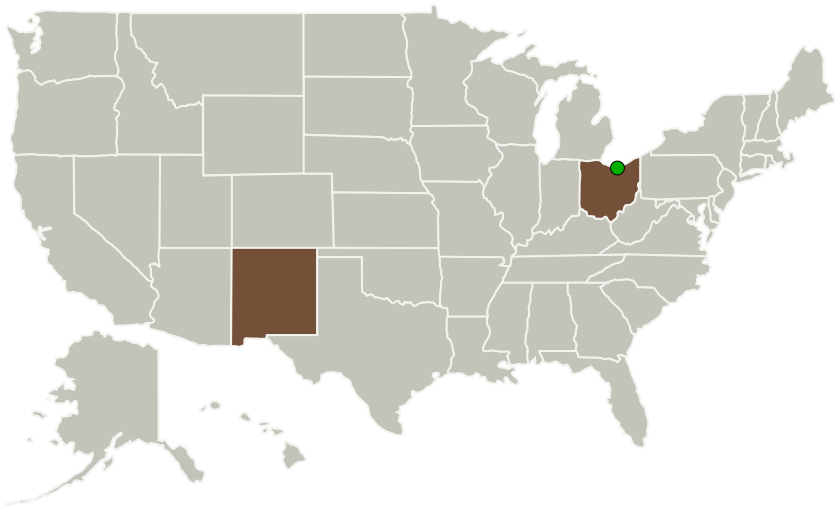
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Southwest Sciences, Inc.	Lead Organization	Industry	Santa Fe, New Mexico
Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
New Mexico	Ohio

Project Transitions

June 2015: Project Start

December 2015: Closed out

Closeout Summary: Instrument for Airborne Measurement of Carbonyl Sulfide, Phase I Project Image

Closeout Documentation:

- Final Summary Chart Image*(https://techport.nasa.gov/file/138995)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Southwest Sciences, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Alan C Stanton

Co-Investigator:

Alan Stanton

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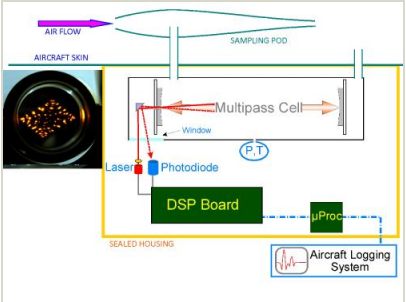
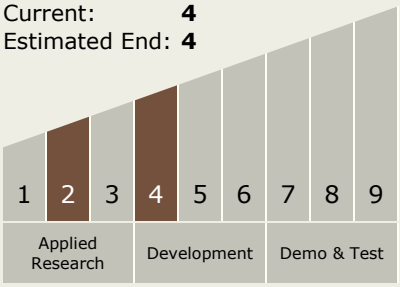
Images



Briefing Chart Image
Instrument for Airborne Measurement of Carbonyl Sulfide, Phase I
(https://techport.nasa.gov/image/131005)

Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.3 In-Situ Instruments and Sensors
    - TX08.3.4 Environment Sensors

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System